

Description

The IRS2003S is a high voltage, high speed power MOSFET drivers with dependent high- and low-side referenced output channels. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. The logic input is compatible with standard CMOS or LSTTL output, down to 3.3 V logic. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. The floating channel can be used to drive an N-channel power MOSFET in the high-side configuration which operates up to 250 V.

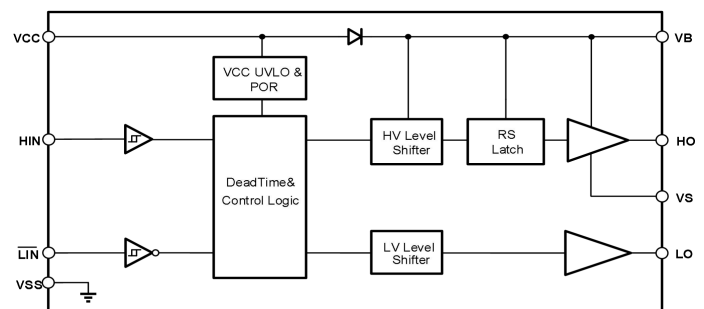
Features and Benefits

- Floating channel designed for bootstrap operation
- Fully operational to +250 V
- 3.3V, 5V and 15V input logic compatible
- dV/dt noise Immunity ± 50 V/nsec
- Allowable negative Vs capability: -9V
- Gate drive supply range from 10V to 20V
- Cross-conduction prevention logic
--Deadtime 520ns
- Propagation delay
--Ton/Toff =680ns/150ns
- Wide operating temperature range -40°C ~125°C
- Typically output Source/Sink current capability: 290mA/600mA
- Integrated Bootstrap diode

Application

- Motor Control
- Air Conditioners/ Washing Machines
- General Purpose Inverters
- Micro/Mini Inverter Drives

Functional Block Diagram



Function Pin Description

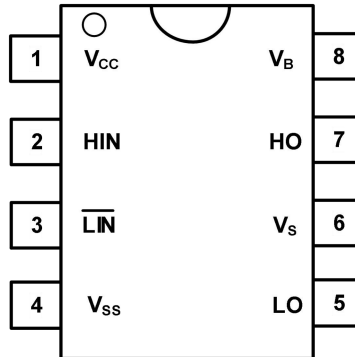


Figure7-1 8-Pin SOP8 Top view

Table7-1 Lead Definitions

Number	Symbol	Description
1	V _{CC}	Low side and logic fixed supply
2	HIN	Logic input for high side gate driver output (HO), in phase
3	$\overline{\text{LIN}}$	Logic input for low side gate driver output (LO), out of phase
4	V _{SS}	Low side return
5	LO	Low side gate drive output
6	V _S	High side floating supply return
7	HO	High side gate drive output
8	V _B	High side floating supply

Absolute Maximum Ratings

Exceeding the limit maximum rating may cause permanent damage to the device. All voltage parameters are rated with reference to VSS and an ambient temperature of 25°C.

Symbol	Definition	MIN.	MAX.	Units
V _B	High side floating supply	-0.3	275	V
V _S	High side floating supply return	V _B - 25	V _B + 0.3	
V _{HO}	High side gate drive output	V _S - 0.3	V _B + 0.3	
V _{CC}	Low side and main power supply	-0.3	25 ^{Note1}	
V _{LO}	Low side gate drive output	-0.3	V _{CC} + 0.3	
V _{IN}	Logic input of HIN & LIN	-0.3	V _{CC} + 0.3	
dV _S /dt	Allowable Offset Supply Voltage Transient		50	V/ns

ESD rating

Symbol	Definition	MIN	MAX	Units
ESD	HBM Model	1500		V
	Machine Model	500		V

Rated power

Symbol	Definition	MIN	MAX	Units
P _D	Package Power Dissipation @ TA ≤ 25°C		625	mW

Thermal information

Symbol	Definition	MIN.	MAX.	Units
R _{thJA}	Thermal Resistance, Junction to Ambient		200	°C/W
T _J	Junction Temperature		150	°C
T _S	Storage Temperature	-55	150	
T _L	Lead Temperature (Soldering, 10 seconds)		300	

Recommended Operating Conditions

For proper operation, the device should be used under the following recommended conditions. The bias ratings of VS and VSS are measured at a supply voltage of 15V, and unless otherwise specified, the ratings of all voltage parameters are referenced to VSS and the ambient temperature is 25°C.

Symbol	Definition	MIN.	MAX.	Units
V _B	High side floating supply	V _S + 10	V _S + 20	V
V _S	High side floating supply return ^{Note2}	-9	250	
V _{HO}	High side gate drive output	V _S	V _B	
V _{CC}	Low side and main power supply	10	20	
V _{LO}	Low side gate drive output	0	V _{CC}	
V _{IN}	Logic input of HIN & LIN	0	V _{CC}	
T _A	Ambient temperature	-40	125	°C

Note1: All power supplies tested at 25V.

Note2: Transient negative VS can be used for VSS-50V with a pulse width of 50ns, guaranteed by design.

250V Half Bridge MOSFET/IGBT Gate Driver
Electrical Characteristics

 Valid for temperature range at $T_A=25^\circ\text{C}$, $V_{CC}=V_B=15\text{V}$, $C_L=1\text{nF}$, unless otherwise specified

Dynamical electrical characteristics

Symbol	Definition	MIN.	TYP.	MAX.	Units	Test Condition
t_{ON}	Turn-on propagation delay		680	740	ns	$V_S=0$
t_{OFF}	Turn-off propagation delay		150	220	ns	$V_S=250\text{V}$
t_R	Turn-on rise time		70	170	ns	$V_S=0\text{V}$
t_F	Turn-off fall time		30	90	ns	
DT	Deadtime	400	520	650	ns	
MT	Matching delay ON and OFF			30	ns	

Static electrical characteristics

 Valid for temperature range at $T_A=25^\circ\text{C}$, $V_{CC}=V_B=15\text{V}$, $C_L=1\text{nF}$, unless otherwise specified.

Symbol	Definition	MIN.	TYP.	MAX.	Units	Test Condition
V_{CCUV+}	VCC supply UVLO threshold	8.0	8.9	9.8	V	
V_{CCUV-}		7.4	8.2	9	V	
I_{LK}	High-side floating supply leakage current			50	μA	$V_B=V_S=250\text{V}$
I_{QBS}	Quiescent V_B supply current		50	75	μA	$V_{IN}=0\text{V}$ or 5V
I_{QCC}	Quiescent VCC supply current		120	250	μA	$V_{IN}=0\text{V}$ or 5V
V_{IH}	Logic "1" (\overline{HIN} & \overline{LIN}) input voltage	2.5			V	$V_{CC}=10\text{V}$ to 20V
V_{IL}	Logic "0" (\overline{HIN} & \overline{LIN}) input voltage			0.8	V	$V_{CC}=10\text{V}$ to 20V
V_{OH}	High level output voltage, $V_{BIAS} - V_O$		0.05	0.2	V	$I_o=2\text{mA}$
V_{OL}	Low level output voltage, V_O		0.02	0.1	V	
I_{IN+}	Logic "1" Input bias current		10	20	μA	$\overline{HIN}=5\text{V}$, $\overline{LIN}=0\text{V}$
I_{IN-}	Logic "0" Input bias current		15	30	μA	$\overline{HIN}=0\text{V}$, $\overline{LIN}=5\text{V}$
I_{O+}	Output high short circuit pulsed current	200	290		mA	$V_O=0\text{V}$ $PW \leq 10\mu\text{s}$
I_{O-}	Output low short circuit pulsed current	420	600		mA	$V_O=15\text{V}$ $PW \leq 10\mu\text{s}$
R_{BSD}	Bootstrap diode conduction resistance		200		Ω	$I_{BSD}=1\text{mA}$
V_{BSD}	Bootstrap diode conduction voltage drop		0.6		V	$I_{BSD}=1\text{mA}$

Function Description

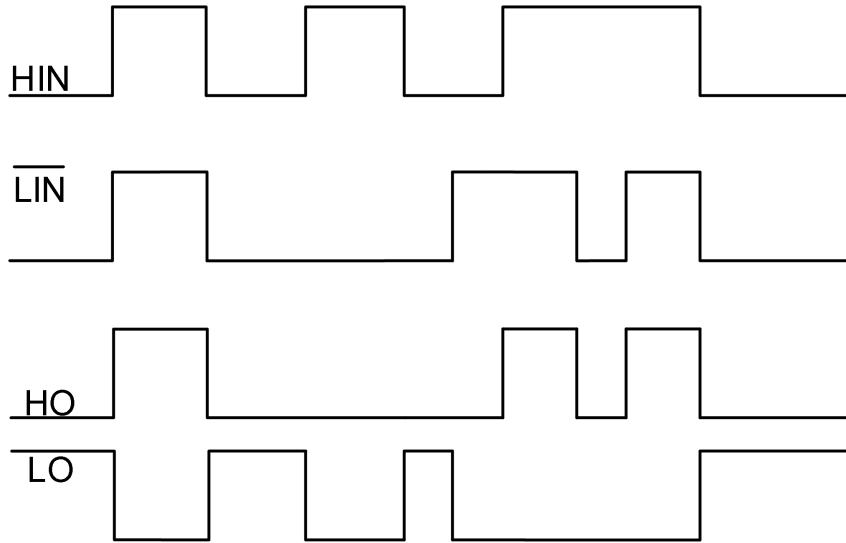


Figure 9-1 IRS2003S Input and output timing waveform

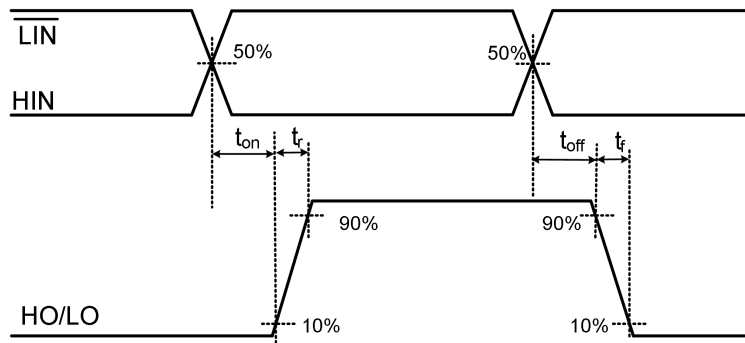


Figure 9-2 Propagation Time Waveform Definition

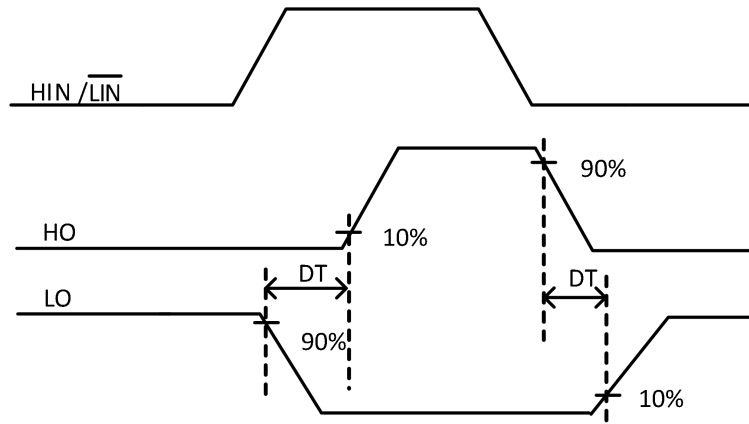


Figure 9-3 Cross Conduction Prevention Delay Time Waveform Definition

Function Block Diagram

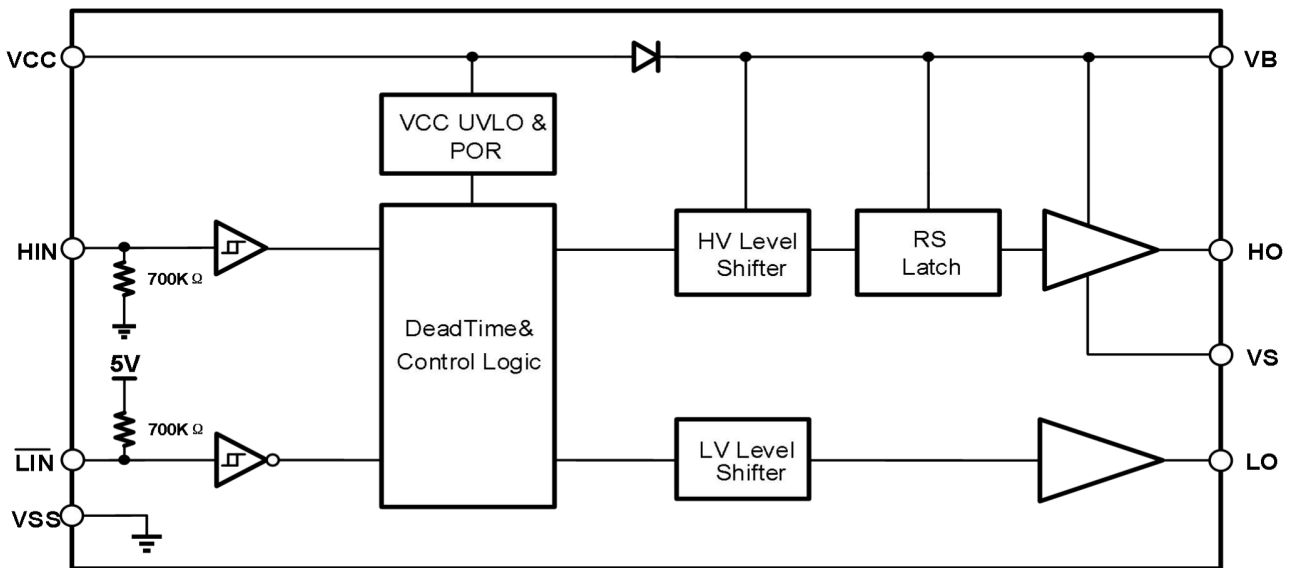


Figure10-1 Function Block Diagram of IRS2003S

Application message

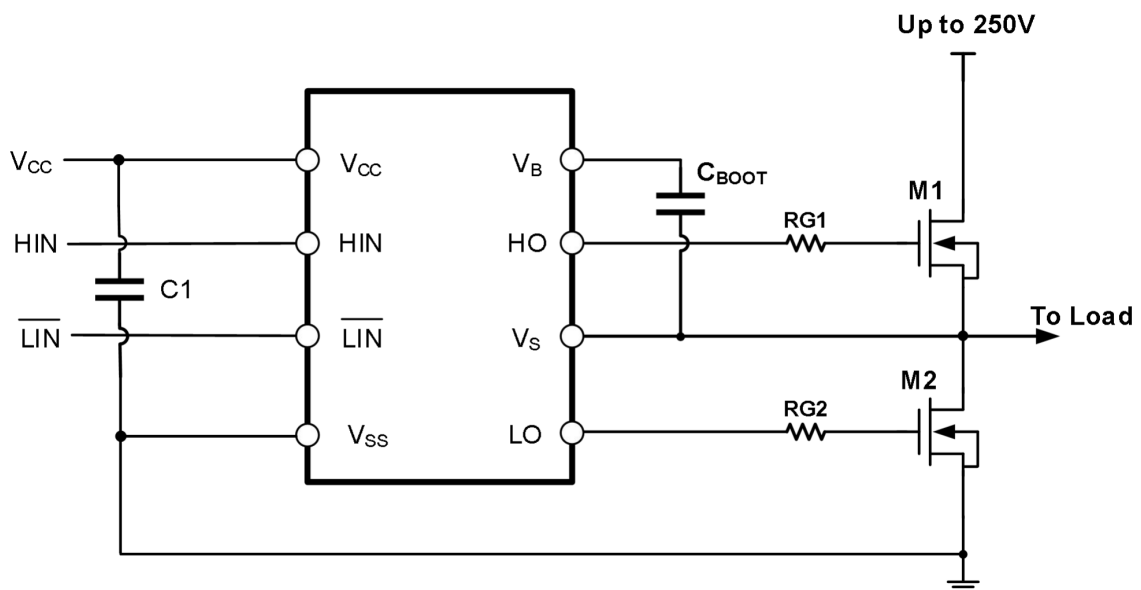
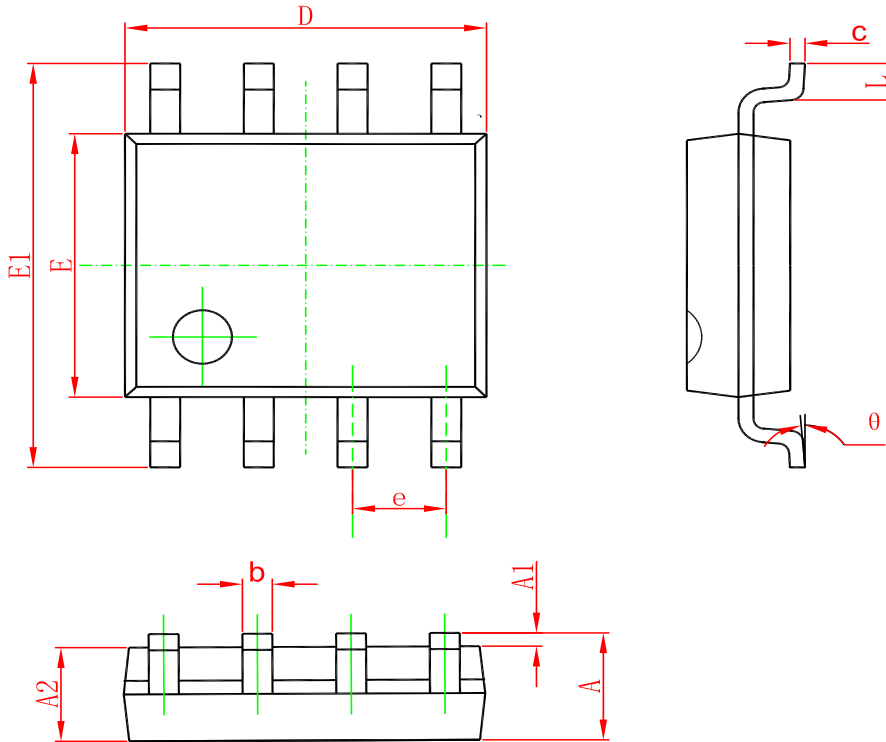


Figure10-2 Typical application circuit of IRS2003S

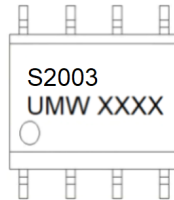
PACKAGE OUTLINE DIMENSIONS

SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW IRS2003STR	SOP-8	2500	Tape and reel

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